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(54) Insulation assembly and method for applying adhesive thereto

Isolieraufbau und Verfahren zum Auftragen von Klebmittel darauf

Ensemble d'isolation et méthode pour appliquer un adhésif

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(56) References cited:
WO-A-93/16874
FR-A- 2 290 937
US-A- 4 208 230
US-A- 5 106 447

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Description

[0001] This invention relates to an insulation assembly and to a process to produce a peel and stick insulation product with improved product properties than what can be obtained with traditional hot melt pressure-sensitive adhesive application methods. The peel and stick product also eliminates the undesirable process of spraying solvent borne and latex adhesives to insulating fiberglass for HVAC and other OEM equipment.

[0002] The process of applying a hot melt adhesive to fiberglass insulation is known. See U. S. Patent No. 5,106,447. A fiberglass product with a preapplied pressure-sensitive adhesive that provides peel and stick qualities is desired by the end-use customer. Traditional methods of applying hot melt adhesives to fiberglass insulation allow the adhesive to adhere only to the surface fibers. This poor contact and surface dust result in a weak interfacial bond between the fiberglass product and the adhesive. Applications of free films and tapes also have been unsuccessful in providing adequate adhesion between the glass and the adhesive.

[0003] The present process applies pressure-sensitive hot melt adhesive to fiberglass insulation with improved adhesion to the insulation surface and the adjoining substrate. As opposed to the typical spray or bead extrusion methods, a ribbon of adhesive is applied and pulled into the blanket of the insulating glass with a vacuum. The adhesive penetrates the glass and becomes an integral part of the insulating blanket. This process allows for the use of traditional hot melt adhesives, but is not limited to hot melts for bonding fiberglass to a variety of surfaces.

[0004] In accordance with a first aspect of the invention, therefore, there is provided an insulation assembly comprising a fibrous batt having an adhesive disposed on one surface and penetrating into the thickness of the batt.

[0005] In accordance with a second aspect of the invention, there is provided also a method for applying an adhesive to an insulation assembly, the method comprising the steps of:

providing a fibrous batt;
disposing an adhesive on one surface of the batt; and
applying a pressure differential across the thickness of the batt so as to force a portion of the adhesive into the batt.

[0006] In accordance with a third aspect of the invention, there is provided as an alternative a method for applying an adhesive to an insulation assembly, the method comprising the steps of:

advancing a fibrous batt toward an adhesive applicator;
dispensing an adhesive from the applicator onto one surface of the batt; and
moving the batt away from the adhesive applicator at a descending angle.

[0007] The invention in described below in greater detail by way of example only with reference to the accompanying drawings in which:

Figure 1 is a view of an insulation assembly according to the invention; and
Figure 2 is a schematic diagram of the process for producing the insulation assembly.

[0008] A vacuum slot, located directly under the adhesive extrusion head, is used to pull the adhesive into the wool. The vacuum draws through the fiberglass blanket and pulls the adhesive stripes into the fiberglass substrate or pack. This action of the vacuum improves adhesion between the adhesive film and the wool by impregnating the wool with the adhesive film. The vacuum also serves to provide a positive contact with the wool during the application process to prevent voids from forming in the adhesive film. This function of the vacuum is especially important when extruding high-viscosity adhesives or when the adhesive film cannot adequately "wet out" the substrate. Poor "wet out" causes the adhesive to concentrate in areas leaving "blobs" and to "skip" or leave areas void of adhesive. The vacuum provides for an even coat, allowing the maximum surface area of the adhesive to be available to contact with both the fiberglass and the adhering substrate. Maximizing the area of contact is key to the adhesion performance of the adhesives in the end-use application.

[0009] It has been found that moving the insulation away from the site of adhesive application at a descending angle also improves the application of the adhesive. In many instances, the descending angle can be used without the vacuum. The insulation may advance toward the application site on a horizontal plane or at an ascending angle.

[0010] The descending angle means the insulation angles away from the horizontal. Typically, insulation moves on a horizontal plane, and the adhesive is applied in a direction perpendicular to the horizontal plane. When moving the insulation toward the application site at an ascending angle, the insulation actually forms a peak beneath the applicator and above the vacuum. Either angle can vary widely. Typically, an angle of 5° (0.087 radians) or 10° (0.175 radians) is sufficient to prevent poor "wet out", "blobs" or "skips".

[0011] Other means of applying a differential pressure can be used to replace or facilitate the action of the vacuum on the adhesive. Pressure applied by a blower or a compressed air source has also been used with limited success. An air knife was used to pressure the adhesive into the wool immediately after it was applied. Although heated air applied by the use of an air knife did improve the application efficiency of the adhesive without leaving

voids, the process window was much smaller than with the use of vacuum. The use of vacuum and forced air was used with equal success as with vacuum used alone.

[0012] The adhesive may be any of those well known to the insulation art. The adhesive generally is applied in varying thickness ranging from about 0.127 to 1 mm (5 to 40 mils), with a desirable thickness being 0.254 to 0.5 mm (10 to 20 mils), and the preferred thickness is about 0.38 mm (15 mils), depending on the nature of the insulation. Common or conventional adhesives, preferably of the pressure-sensitive type, may be utilized, such as an adhesive containing an acrylic base which may be formulated to any specific purpose. For example, the adhesive may include flame retardants and like additives. Another common class is that of the elastomer-based adhesives or the hot melt adhesives. These may be formulated for specific purposes, i.e., dyes, antioxidants, and related adhesive additives or solvents may be included. Specific examples of rubber-based pressure adhesives are blends of styrenebutadiene rubber, polyisoprene and related dienes or olefin polymers, with suitable tackifiers such as those commercially available. Prior to using our vacuum step, the adhesive is applied by any of the conventional means of applying adhesives, such as coating, doctoring, or brushing.

[0013] The hot melt adhesive also may be isotactic thermoplastic polybutene-1/ethylene copolymer. The polybutylene copolymers are copolymers of polybutene-1 and ethylene wherein the ethylene content varies from about 5.5 to about 10% by weight of the copolymer. The applicable isotactic polybutylenes are relatively rigid while in their plastic form but flow readily upon being heated.

[0014] Generally, any conventional release coat may be utilized, such as a silicone coat. The release strip may vary in thickness from about 12.7 μm (0.5 mil) to 0.127 or 0.152 mm (5 or 6 mils) or more, with the cost being usually a controlling factor, as well as flexibility. A desirable thickness, in most instances, is 0.025 to 0.1 mm (1 to 4 mils) and preferably 0.051 to 0.076 mm (2 to 3 mils) depending on use. The release coat is applied to a carrier strip such as Kraft paper, polyethylene-coated paper or film, and the like. The release agent can be coated on the carrier strip by any of the well-known ways, such as by roll coating or Rotogravure printing.

[0015] Fibrous glass wool insulation often combines a binder, such as a phenolic resin, with glass wool subsequent to the fiberizing process. The resultant insulating material assembly had sufficient strength to support itself in long strips so that it could be, for example, placed between adjacent wall studs or ceiling trusses in a commercial or residential building.

[0016] Glass fiber insulation is generally made by laying down a blanket of multiple horizontal layers of glass fibers onto a moving belt. Thus, current practice applies binder materials to the fibers as the insulation blanket is being formed, and to partially compress and heat the resulting blanket to cure the binder. The blanket is thereafter cut into batts or rolls and tightly compressed for packaging and transport.

[0017] Recent inventions relate to insulation assemblies in which all binder or essentially all of the binder is eliminated. The binderless batt may be enclosed by an exterior layer to form a low-density insulation assembly having satisfactory resiliency. The insulation assembly of this invention may include a binder or be binderless.

[0018] Referring to Figure 1, an insulation assembly, according to the present invention, is generally indicated by the reference number 10. The insulation assembly 10 includes a mineral fiber batt such as a fibrous glass batt 11. The term "batt" refers to a mineral fiber batt. The body of the batt is self-supporting and does not disintegrate or fall apart as would be true of, for example, individual units of fibrous glass loose-fill material. Accordingly, the mineral fiber batt 11 has integrity and is capable of being picked up and remaining intact.

[0019] The density of mineral fiber batt 11 can vary widely. Typically, the density ranges from 8 to 160 kg/m^3 (0.5 to 10.0 pounds per cubic foot (pcf)).

[0020] Figure 2 shows process line 20. Melter 21 supplies hot melt adhesive through pumping station 22 to unit applicator 23. Unit 23 can be any hot melt adhesive applicator. Vacuum box 24 is stationed below unit 23. Insulation batt (not shown) passes between unit 23 and vacuum box 24 where an adhesive (not shown) is applied to the insulation. Typically, the insulation is in the form of a continuous blanket supplied by wool payout machine 26 or in discontinuous batts or boards. Release liner 28 next is applied over the adhesive prior to packaging. Shown is roll-up machine 30 for packaging the insulation into a roll. Often the insulation may be cut (not shown) into batts after release liner 28 is applied. The batts may be rolled up with machine 30 or packaged as linear batts. All of these packages are standard insulation packages.

[0021] Generally, the adhesive is applied in an amount ranging from 43 to 258 g/m^2 (4 to 24 grams per square foot) of batt.

[0022] Figure 2 shows the insulation advancing toward unit 23 at an ascending angle and moving away from unit 23 at a descending angle. The angles can be achieved merely by positioning the rollers under the conveyor belt to form these angles.

[0023] The following example illustrates the invention.

Example

[0024] Adhesives comprised of styrene isoprene block copolymer blended with C-5 feedstock hydrocarbon resin and C-9 reinforcing end block resin were used. Commercially available additives such as liquid plastisizing resins and antioxidants were also used. The samples were prepared as follows. The samples were all HV-24 insulation which has a density of about 24 kg/m^3

(1.5 pcf). Typically, we used a thickness of insulation of 15.9 mm (5/8"). Some samples, however, had a density ranging up to 48 kg/m^3 (3 pcf) and thickness up to 25 mm (1").

[0025] The insulations were faced with either a plain foil or a foil/scrim Kraft laminate under existing procedures for facing insulation.

[0026] Regarding adhesive coverage, the adhesive was applied at 86 g/m^2 (8g/ft^2) with some samples ranging up to 161 g/m^2 (15g/ft^2). The adhesive equipment had an output of 216 kg (476 pounds) per hour and was able to apply 6 strips per 0.093 m^2 (1 ft^2). The adhesive strips were 25 mm (1") wide with a 25 mm (1") space between strips. Assuming an adhesive weight of 2 grams per strip, this would result in 129 grams of adhesive per square meter (12 g/ft^2) for a 1.83 m (6 ft) wide product with continuous production and 15.2 m (50 ft) per minute.

[0027] The vacuum pull on the vacuum box had a negative pressure of 0.051 to 507 mm of water [4°C] (0.2 to 20 inches of water).

[0028] The above samples produced insulation panels with adhesive for securement to sheet metal surfaces of heating and air conditioning units. Samples of the various insulations were subjected to a peel strength test. Specimens of insulation having a 24 kg/m^3 (1.5 pcf) density and a thickness of 15.9 mm (5/8") and measuring 25 mm (1") by 305 mm (12") were bonded to a piece of steel painted with acrylic paint. Specimens were bonded to steel painted with an alkyd paint. Other specimens were bonded to galvanized steel and cold-rolled steel.

[0029] Testing found the insulating materials acceptable with or without a facing. The surfaces on which the insulation may be applied are bare metals (sheet steel, galvanized, aluminum-coated, etc.) and any painted steel (alkyd, acrylic, epoxy, polyester-type paint). Appliances using the insulation panels were found useful at temperatures ranging up to 90°C (194°F) during normal operation and 220°C (428°F) during abnormal operation. The panels also were useful for outdoor use (tested at -29°C (-20°F)).

Claims

1. An insulation assembly (10) comprising a fibrous batt (11) having an adhesive disposed on one surface and penetrating into the thickness of the batt.

2. An insulation assembly according to claim 1, wherein the fibrous batt is of low-density fibrous glass wool.

3. An insulation assembly according to claim 1 or claim 2, including also a release liner (28) disposed on the adhesive on the surface of the batt.

4. An insulation assembly according to any one of claims 1 to 3, wherein the batt has a density of 8 to 160 kg/m^3 (0.5 to 10.0 pounds per cubic foot).

5. An insulation assembly according to any one of claims 1 to 4, wherein the adhesive is present in an amount of 43 to 258 g/m^2 (4 to 24 g/ft^2) of the surface of the batt.

6. An insulation assembly according to any one of claims 1 to 5, wherein the adhesive is a hot melt adhesive.

7. An insulation assembly according to claim 6, wherein the adhesive comprises an isotactic thermoplastic polybutene-1/ethylene copolymer.

8. A method for applying an adhesive to an insulation assembly, the method comprising the steps of:

   providing (26) a fibrous batt;
   disposing (21,22,23) an adhesive on one surface of the batt; and
   applying (24) a pressure differential across the thickness of the batt so as to force a portion of the adhesive into the batt.

9. A method according to claim 8, wherein the fibrous batt is of a low-density fibrous glass wool and the adhesive is a hot melt adhesive.

10. A method according to claim 8 or claim 9, wherein a vacuum is drawn against the other surface of the batt to create a pressure differential of 50 to 5,000 Pa (0.2 to 20 inches of water) across the thickness of the batt.

11. A method according to any one of claims 8 to 10, including the further step of disposing a release liner (28) on the adhesive on the surface of the batt.

12. A method for applying an adhesive to an insulation assembly, the method comprising the steps of:

   advancing a fibrous batt toward an adhesive applicator (23) ;
   dispensing an adhesive from the applicator onto one surface of the batt; and
   moving the batt away from the adhesive applicator at a descending angle.

13. A method according to claim 12, including the further step of drawing a vacuum (24) against the other surface of the batt so as to draw a portion of the adhesive into the batt.

14. A method according to claim 12 or claim 13, wherein the vacuum is drawn against the surface of the batt

beneath the adhesive applicator (23).

15. A method according to any one of claims 12 to 14, wherein the fibrous batt advances towards the adhesive applicator at an ascending angle.

16. A method according to any one of claims 12 to 15, wherein the batt advances towards the adhesive applicator in a generally horizontal direction and the adhesive moves in a direction generally perpendicular to the horizontal direction of movement of the batt.

17. A method according to any one of claims 12 to 16, wherein the descending angle is from 5 to 10°C to the horizontal.

Patentansprüche

1. Isolieraufbau (10) mit einer Faserplatte (11), auf deren einen Oberfläche ein Klebstoff aufgebracht ist, der in die Dicke der Platte dringt.

2. Isolieraufbau nach Anspruch 1, bei dem die Faserplatte aus Glasfaserwolle geringer Dichte ist.

3. Isolieraufbau nach Anspruch 1 oder 2, der ein auf dem Klebstoff auf der Plattenoberfläche aufgebrachtes Abziehdeckpapier (28) aufweist.

4. Isolieraufbau nach einem der Ansprüche 1 bis 3, bei dem die Platte eine Dichte von 8 bis 160 kg/m^3 (0,5 bis 10,0 Pfund pro Kubikfuß) besitzt.

5. Isolieraufbau nach einem der Ansprüche 1 bis 4, bei dem der Klebstoff in einer Menge von 43 bis 258 g/m^2 (4 bis 24 g/ft^2), bezogen auf die Plattenoberfläche, aufgebracht ist.

6. Isolieraufbau nach einem der Ansprüche 1 bis 5, bei dem der Klebstoff ein Heißschmelzklebstoff ist.

7. Isolieraufbau nach Anspruch 6, bei dem der Klebstoff ein isotaktisches thermoplastisches Polybuten-1/Ethylencopolymer enthält.

8. Verfahren zum Auftragen eines Klebstoffs auf einen Isolieraufbau, bei dem

   eine Faserplatte bereitgestellt wird (26),
   ein Klebstoff auf eine Oberfläche der Platte aufgebracht wird (21, 22, 23), und
   eine Druckdifferenz über der Plattendicke erzeugt wird (24), um einen Teil des Klebstoffs in die Platte zu pressen.

9. Verfahren nach Anspruch 8, bei dem die Faserplatte aus Glasfaserwolle geringer Dichte besteht und der Klebstoff ein Heißschmelzklebstoff ist.

10. Verfahren nach Anspruch 8 oder 9, bei dem ein Vakuum an der anderen Oberfläche der Platte erzeugt wird, um eine Druckdifferenz von 50 bis 5000 Pa (0,2 bis 20 Zoll Wasser) über der Plattendicke zu erzeugen.

11. Verfahren nach einem der Ansprüche 8 bis 10, bei dem weiterhin ein Abziehdeckpapier (28) auf den Klebstoff auf der Plattenoberfläche aufgebracht wird.

12. Verfahren zum Aufbringen eines Klebstoffs auf einen Isolieraufbau, bei dem

   eine Faserplatte an eine Auftrageinrichtung (23) herangeführt wird,
   ein Klebstoff von der Auftrageinrichtung auf eine Oberfläche der Platte ausgegeben wird, und die Platte von der Klebstoff-Auftrageinrichtung in abfallendem Winkel entfernt wird.

13. Verfahren nach Anspruch 12, bei dem weiterhin ein Vakuum (24) an der anderen Oberfläche der Platte erzeugt wird, um einen Teil des Klebstoffs in die Platte zu ziehen.

14. Verfahren nach Anspruch 12 oder 13, bei dem das Vakuum an der Oberfläche der Platte unterhalb der Klebstoff-Auftrageinrichtung (23) erzeugt wird.

15. Verfahren nach einem der Ansprüche 12 bis 14, bei dem die Faserplatte in einem aufsteigenden Winkel an die Klebstoff-Auftrageinrichtung herangeführt wird.

16. Verfahren nach einem der Ansprüche 12 bis 15, bei dem die Platte in im wesentlichen horizontaler Richtung an die Klebstoff-Auftrageinrichtung herangeführt wird und der Klebstoff sich in einer Richtung bewegt, die im wesentlichen senkrecht auf die horizontale Bewegungsrichtung der Platte steht.

17. Verfahren nach einem Ansprüche 12 bis 16, bei dem der abfallende Winkel 5 bis 10° zur Horizontale beträgt.

Revendications

1. Ensemble isolant (10) comportant une plaque fibreuse (11) sur une surface de laquelle est disposé un adhésif qui pénètre dans l'épaisseur de ladite plaque.

2. Ensemble isolant selon la revendication 1, dans le-

quel la plaque fibreuse est en laine de verre fibreuse à faible densité.

3. Ensemble isolant selon la revendication 1 ou 2, comportant également une doublure de séparation (28) qui est disposée sur l'adhésif prévu sur la surface de la plaque.

4. Ensemble isolant selon l'une quelconque des revendications 1 à 3, dans lequel la plaque a une densité de 8 à 160 kg/m^3 (0,5 à 10,0 livres par pied cube).

5. Ensemble isolant selon l'une quelconque des revendications 1 à 4, dans lequel la quantité d'adhésif prévue est de 43 à 258 g/m^2 (4 à 24 g/ft2) de la surface de la plaque.

6. Ensemble isolant selon l'une quelconque des revendications 1 à 5, dans lequel l'adhésif est un adhésif à fusion.

7. Ensemble isolant selon la revendication 6, dans lequel l'adhésif contient un copolymère polybutène-1/éthylène thermoplastique isotactique.

8. Méthode pour appliquer un adhésif sur un ensemble isolant, consistant à :

   - fournir (26) une plaque fibreuse,
   - disposer (21, 22, 23) un adhésif sur une surface de la plaque, et
   - appliquer (24) une différence de pression sur l'épaisseur de la plaque de manière à enfoncer une partie de l'adhésif dans la plaque.

9. Méthode selon la revendication 8, selon laquelle la plaque fibreuse est en laine de verre fibreuse à faible densité, et l'adhésif est un adhésif à fusion.

10. Méthode selon la revendication 8 ou 9, selon laquelle un vide est créé sur l'autre surface de la plaque afin de produire une différence de pression de 50 à 5000 Pa (0,2 à 20 pouces d'eau) sur l'épaisseur de la plaque.

11. Méthode selon l'une quelconque des revendications 8 à 10, consistant en outre à disposer une doublure de séparation (28) sur l'adhésif prévu sur la surface de la plaque.

12. Méthode pour appliquer un adhésif sur un ensemble isolant, consistant à :

   - amener une plaque fibreuse vers un applicateur d'adhésif (23),
   - disposer un adhésif, à partir de l'applicateur, sur une surface de la plaque, et
   - éloigner la plaque de l'applicateur d'adhésif suivant un angle descendant.

13. Méthode selon la revendication 12, consistant en outre à créer un vide (24) sur l'autre surface de la plaque de manière à faire pénétrer une partie de l'adhésif dans la plaque.

14. Méthode selon la revendication 12 ou 13, selon laquelle le vide est créé sur la surface de la plaque au-dessous de l'applicateur d'adhésif (23).

15. Méthode selon l'une quelconque des revendications 12 à 14, selon laquelle la plaque fibreuse avance vers l'applicateur d'adhésif suivant un angle ascendant.

16. Méthode selon l'une quelconque des revendications 12 à 15, selon laquelle la plaque avance vers l'applicateur d'adhésif dans un sens généralement horizontal, et l'adhésif se déplace dans un sens généralement perpendiculaire au sens horizontal du mouvement de la plaque.

17. Méthode selon l'une quelconque des revendications 12 à 16, selon laquelle l'angle descendant est de 5 à 10° par rapport à l'horizontale.

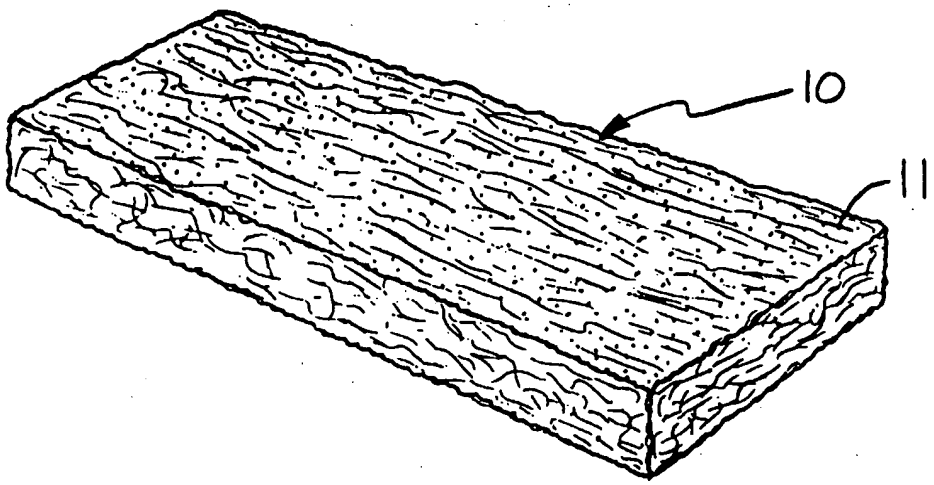

FIG. 1

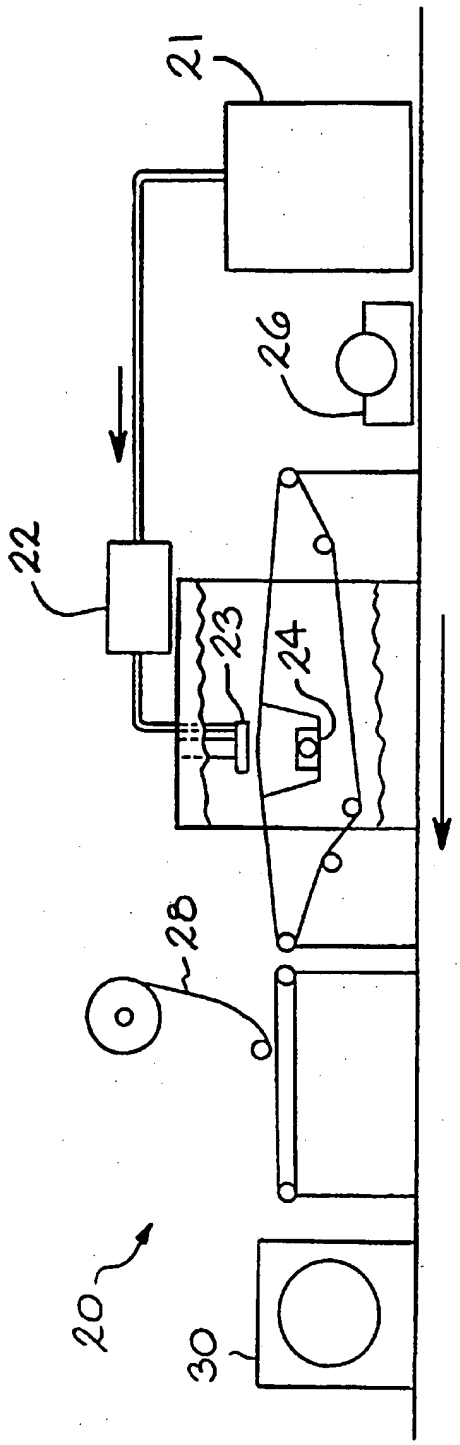

FIG. 2